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EXPANDED METAL MESH AND TOOL FOR PRODUCING EXPANDED METAL MESHES
[Streckgitter und Werkzeug zur Herstellung von Streckgitter]

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The invention relates to an expandable metal mesh and a tool for producing expandable metal meshes. /1*

An expandable metal mesh with meshes that are diamond-shaped or rectangular in the delivered state are known. Longitudinal elongation and transverse contraction are coupled due to this geometry. Because of this known property, there is a relatively low degree of shape adaptability by expandable metal meshes to surfaces that are highly curved three-dimensionally. This restriction is overcome rather laboriously by dividing up the mesh or by folding or cutting and doubling of the material.

An expandable metal mesh is known from DE 3642063 that can be modeled plastically as a reinforcement insert for a sheet, web or strip-like covering material with high conformability to complex three-dimensional shapes and is usable as a covering for a roof peak or ridge. This covering material consists in essence of an elastomeric layer and the expandable metal mesh serving as a reinforcement element. The expandable metal mesh has a longitudinal elongation of 50-150% and an elongation in the transverse direction of <20%, which are mutually exclusive, as well as a restoration of 5%.

An expandable metal mesh with good modeling properties is also known from EP 0797486. In this known expandable metal mesh, two mesh nodes, offset from one mesh row to the next mesh row, are severed by an incision perpendicular to the actual expansion incision. Such an expandable metal mesh is distinguished by outstanding three-dimensional shapability.

Finally, improving the expansion behavior of expandable metal meshes is known from /2
DE 19821574.6 by producing an additional transverse corrugation in the sheet metal, whether by using corrugated or trapezoid sheet metal as the starting material, or by introducing a corrugation into a flat expandable metal mesh during the production process. Mesh rods bent in an S-curve are produced by subsequent rolling.

* [Numbers in right margin indicate pagination of the original text.]

Known expandable metal meshes are disadvantageous because they cannot be economically manufactured. Handling them also leaves something to be desired, in comparison to normal expandable metal meshes.

The invention is based on the problem of creating an expandable metal mesh that can be manufactured economically and can be stretched simultaneously in two directions, or at least has no transverse contraction when stretched longitudinally. The creation of a tool for economically manufacturing expandable metal meshes is also a problem of the invention.

This problem is solved according to the invention by an expandable metal mesh with a tool as described in Claims 1-8. Advantageous configurations of the invention are described in the subordinate claims.

The expandable metal mesh according to the invention is distinguished in that it is cut in such a manner that certain webs are connected to one another only very thinly, i.e., certain mesh nodes are constructed as designed breaking points. The manufacturing process proceeds as for normal expandable metal meshes, and the expandable metal mesh produced can also be handled and worked comfortably in the same manner as a normal expandable metal mesh. In particular, the expandable metal mesh according to the invention has a uniformly flat surface and there is no danger of mutual tangling /3
as is the case, for example, with an expandable metal mesh according to EP 0 797 486, in which mesh nodes are severed by an incision perpendicular to the actual expansion incision.

The meshes according to the invention can be filled with hardening or elastically polymerizing or drying substances or compounds, or can be coated, and can therefore be used as a plaster base, as well as in the roofing field as a so-called "lead sheet substitute." Other application possibilities are

– spacers for ventilated trim panels,

– custom-molded packaging for spherical objects and the like,

– drying mesh and filter baskets for industry and households,

– GFK-replacing repair mats in the automobile field and the like.

Applications are also conceivable in which forces must be absorbed in case of an overload, as in covers on rotating machines or safety fences on streets.

It is expedient for the mesh according to the invention to construct the mesh nodes at the designed breaking points in regular succession. For example, every second mesh node or two of every three mesh nodes, offset from one mesh row to the next, can be formed as designed breaking points.

Another variant is to construct meshes with only designed breaking points at least in locally limited parts of the mesh, while peripheral areas are formed without designed breaking points in order to avoid undesired tearing. To increase the stability and strength, such meshes can be laid one upon the other at an angle, and particularly a right angle.

The mesh according to the invention with the formation of individual mesh nodes as designed /4 breaking points can also be combined with an expanded metal having better stretching behavior according to DE 19821574.6. Starting from trapezoid sheet metal, corrugated sheet metal or similarly preformed sheet metal, the expansion incisions are made in such a manner that certain webs are only connected to one another very weak, so that designed breaking points are formed at these places. The connections at these mesh nodes formed as designed breaking points however are sufficiently stable to open only in case of deliberate shaping.

The weakened designed breaking point nodes can be produced with a conventional tool already during manufacturing by increased cutting depth setting. With such a conventional tool, however, designed breaking points can only be produced in the entire mesh.

If designed breaking points are to be produced only in a regular sequence, however, for example only at every second or third mesh node, then this can be done with a tool having different-sized tooth depths.

With a "normal" cutting depth, such a tool produces conventional mesh nodes, and at the points with deeper teeth bases, it produces mesh nodes designed to break.

In place of mesh nodes designed to break, a smooth severance of individual nodes can be produced with a lower depth of the teeth bases, so that a mesh according to EP 0797486 is obtained, i.e., a mesh in which, offset from mesh row to mesh row, every second and/or third mesh node is severed, which yields a mesh that can be optimally shaped spherically.

The invention will be explained in greater detail below with reference to the appended drawings. Therein:

Figure 1 shows the representation of the production of an expandable metal mesh in perspective and /5
side views;

Figure 2 schematically shows a shear knife with teeth formed to different depths for producing an expandable metal mesh according to the invention;

Figure 3 thematically shows, in the viewing direction A in Figure 1, the representation of expandable metal mesh production with the tool according to Figure 2;

Figure 4 shows an expandable metal mesh having alternating normally joined webs and nearly severed webs that is produced with a shear knife according to Figure 2;

Figure 5 shows expandable metal mesh corresponding to Figure 4 in a partially stretched condition;

Figure 6 shows a variant of an expandable metal mesh that is produced with a different knife guidance, likewise in a partially stretched condition;

Figure 7 shows an expandable metal mesh in which two of every three webs are formed as designed breaking points;

Figure 8 shows expandable metal meshes laid one atop another at a right angle, which are continuously with designed breaking points throughout;

Figure 9 shows shear knife variants in a front view;

Figures 10-14 show a plan view of expandable metal meshes that were produced with the shear knives according to Figure 9;

Figure 15 schematically shows additional shear knife variants in a front view; /6

Figures 16-22 schematically show a plan view of expandable metal meshes produced with the shear knives according to Figure 15.

Expandable metal meshes are constructed as shown in Figure 1. The sheet metal 20 to be stretched is cyclically advanced across a knife edge 21 constituting a lower knife part.

An upper knife part 22 with a toothed front face 23 is lowered over the sheet metal strip advanced across knife edge 21. In the process it slits sheet metal 20 along knife edge 21 and presses the projecting sheet metal strip obliquely downward with simultaneous stretching. Half a mesh is formed. In the next cycle, the upper knife part is lowered offset, for example, by 1/2 a mesh width to the side, whereby the expandable metal mesh is finished.

With expandable metal mesh tools of the known type, expandable metal meshes are produced that have exclusively strong mesh nodes or mesh nodes differing only slightly in strength, with webs that are corrugated only slightly for decorative purposes, "festooned mesh." In all these expandable metal meshes from prior art, even those with regularly asymmetrical mesh shapes, the distance between the respective nodes is not variable systematically and in a targeted manner. For the purpose of considerably expanded deformability, e.g., spherical or hyperboloid deformation of even locally limited parts of the mesh and at the same time without deformation of adjacent mesh areas, precisely this node spacing variability is of crucial importance and is realizable economically for the first time by means of tools modified according to the invention.

The production of a expandable metal mesh according to the invention becomes possible by forming /7

the shear knife with teeth of different depths. Such a such a shearing knife 1 with teeth 2 is schematically shown in Figure 2. While the tips 3 of the teeth are uniformly the same, only every other tooth base 4a is formed as wide as the tooth tips 3. The other tooth bases 4b are formed less deeply and more narrowly. Thereby an expandable metal mesh 5 according to Figures 3 and 4 having alternating normally joined webs and nearly severed webs (designed breaking points) can be produced.

A similar expandable metal mesh 7 in a partially elongated state is shown in Figure 5. The circles 8 mark the nearly severed webs 6b, and the points 9a and 9b mark a previously contiguous node. Because of the enlargement of the meshes, an elongation of roughly 35% is produced without transverse contraction.

A similar expandable metal mesh 10 with a different knife guidance is shown in Figure 6. Here the shearing knife is moved twice to the right or left each time, as is recognizable from the circles 11 marking the designed breaking points.

An elongation of nearly 100% can be achieved if two of three webs are constructed as designed breaking points 12, as shown in Figure 7.

Finally, Figure 8 shows two expandable metal meshes 13a and 13b laid one atop another at a right angle, which are continuously or intermittently formed with designed breaking points 14.

The superimposed meshes can be fixedly connected to one another by an embedding compound.

The invention was described in connection with expandable metal meshes with Figures 2-8. In principle the invention can be applied to any desired perforated metal sheets. For example, expandable /8
metal meshes 13a and 13b could also be produced as perforated metal sheets with nearly square holes and designed breaking points 14 machined simultaneously.

A variant of the shearing knife for producing expandable metal meshes according to the invention was represented in Figures 2 and 3. Figures 9 and 15 show additional variants of the knife contours, with

which expandable metal meshes according to Figures 10-14 and 16-22, respectively, can be produced. The association of the knife and the expandable metal mesh produced by it is illustrated by the corresponding numbering in the figures of the drawing.

The knife 0 in Figure 9 and the associated mesh 0 in Figure 10 present the prior art, while the knives 1/2.1 through 1/2.4 in Fig. 9 and the knives 2/3.1 through 2/3.4 in Figure 15 have implemented one or more of the following characteristics:

1. tooth bases machined out to different depths between the individual teeth
2. tooth bases and/or tips of different widths
3. tooth flanks of differing steepness
4. different spaces between the individual teeth.
5. different heights of the teeth tips.

Features 1-5 are preferably realized in a regular sequence across the width of the tool, e.g., on every second or third tooth, on two of three teeth or in other expedient combinations. By modifying the respective incision depth, one obtains weakened nodes (designed breaking points) or even completely severed "loose" nodes, wherein one obtains expansion meshes with partially straight and partially angled webs according to Figures 11-14 and 16-19 with knives according to Figures 9 and 15, whereas knives according to Figure 15 with an offset increased to 3/2, 5/2,... (2n+1)/2 mesh widths yield expansion /9
meshes with angled webs according to Figures 20-22 throughout.

Tools with one or more of the above-mentioned features allow for the first time the economical manufacturing of expandable metal meshes that can be shaped two-dimensionally to a high degree, with the remaining solid nodes and angled webs connecting them for the purpose of the systematically activatable modification of the node spacing.

Claims /10

1. Expandable metal mesh consisting of a network of mesh webs and mesh nodes, characterized in that at least the individual mesh nodes are constructed as designed breaking points (6b).

2. Expandable metal mesh according to Claim 1, characterized in that mesh nodes are formed as designed breaking points (6b) in a regular sequence.

3. Expandable metal mesh according to Claim 2, characterized in that every second mesh node, offset from one mesh row to the next, is formed as a designed breaking point (8, 11).

4. Expandable metal mesh according to Claim 2, characterized in that two of every three mesh nodes, offset from one mesh row to the next, are formed as designed breaking points (12).

5. Expandable metal mesh according to one of the preceding claims, characterized in that mesh nodes are formed as designed breaking points in locally limited areas of the mesh.

6. Expandable metal mesh according to Claim 1 or 2, characterized by two webs (13a, 13b) superimposed at an angle that are formed throughout or intermittently with designed breaking points (14).

7. Expandable metal mesh according to one of the preceding claims, characterized in that it is formed /11
of a corrugated metal sheet or a trapezoid metal sheet or a similarly deformed metal sheet or a perforated mesh as the starting material.

8. Tool for manufacturing expandable metal meshes, with an upper knife part (22) with a toothed end face (23) or knife contour, characterized by one or more of the following features:

1. tooth bases machined out to different depths between the individual teeth

2. tooth bases and/or tips of different widths

3. tooth flanks of differing steepness

4. different spaces between the individual teeth

5. different heights of the teeth tips.

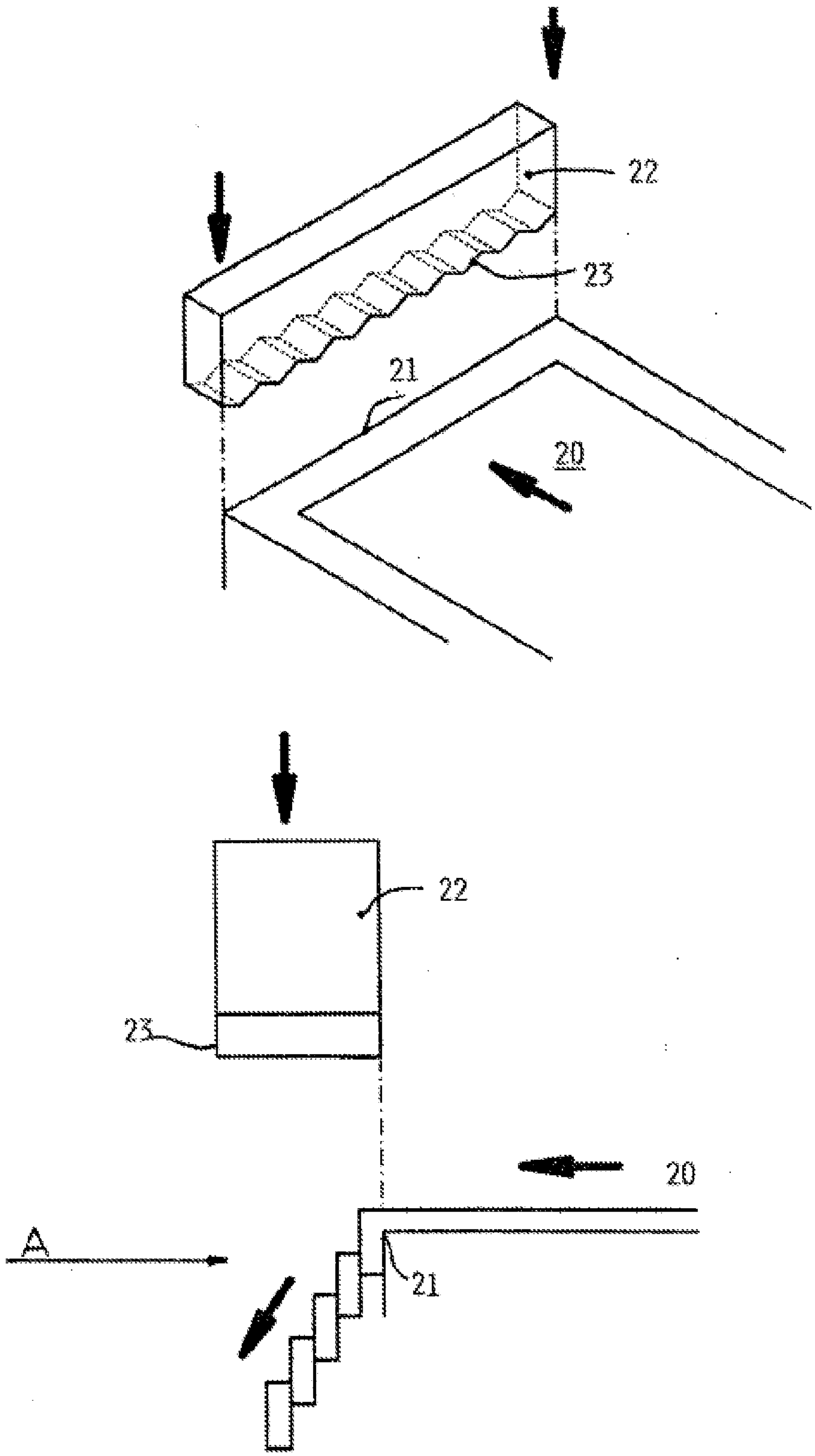


Figure 1

Replacement sheet (Rule 26)

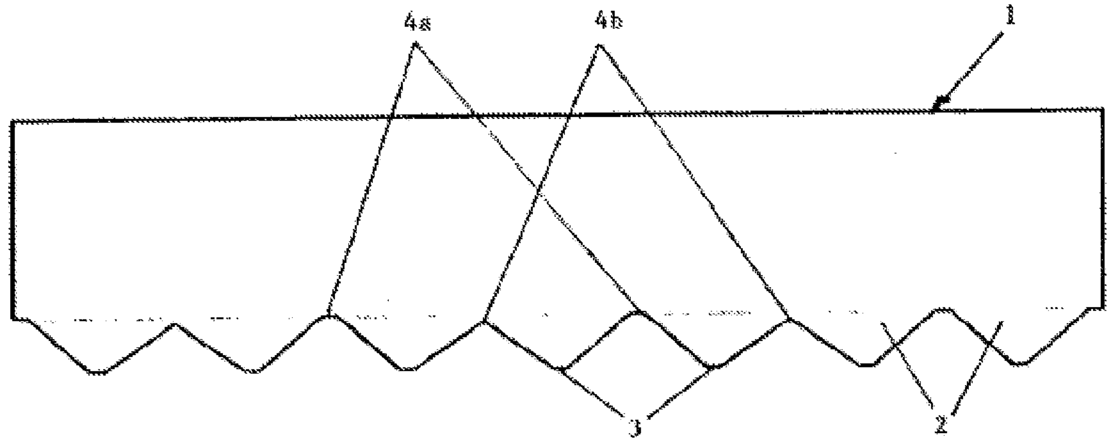


Figure 2

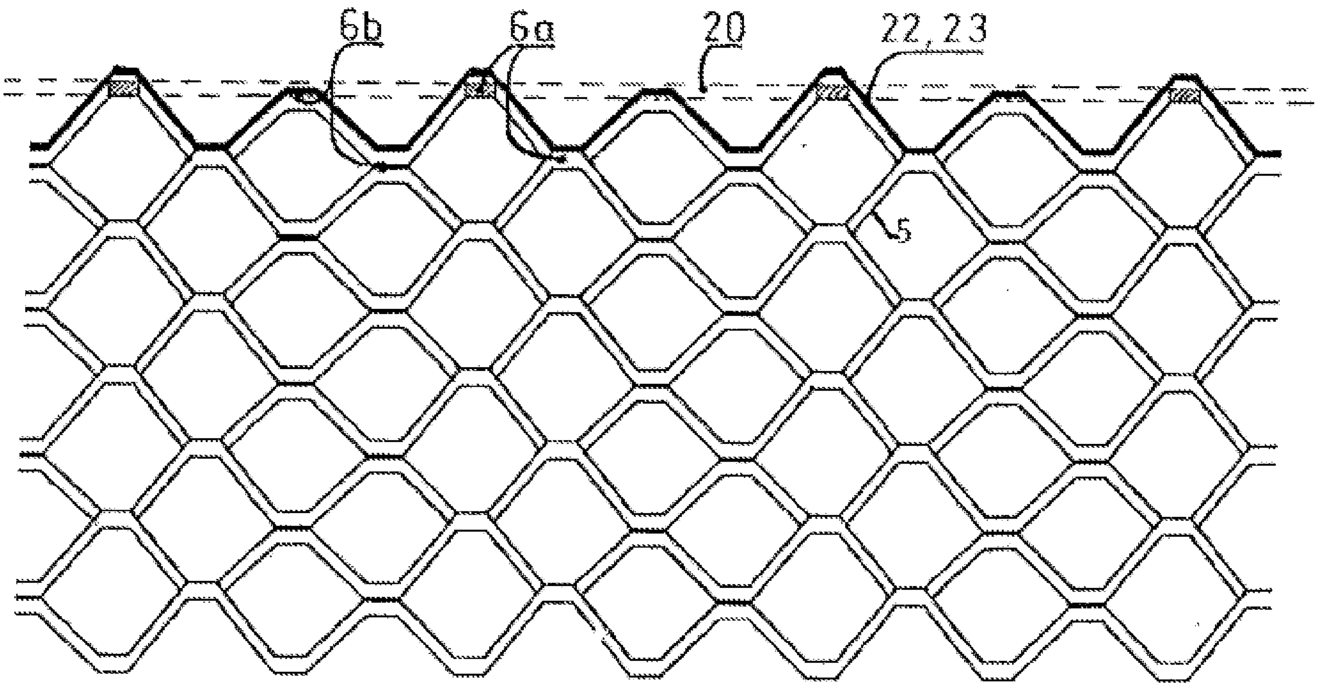


Figure 3

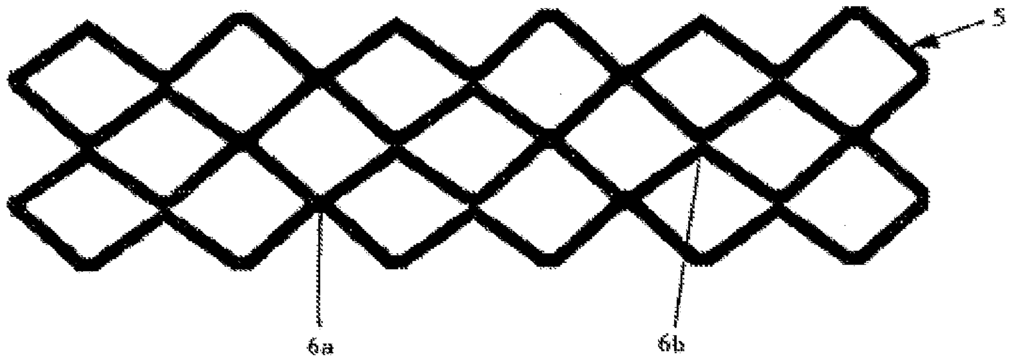


Figure 4

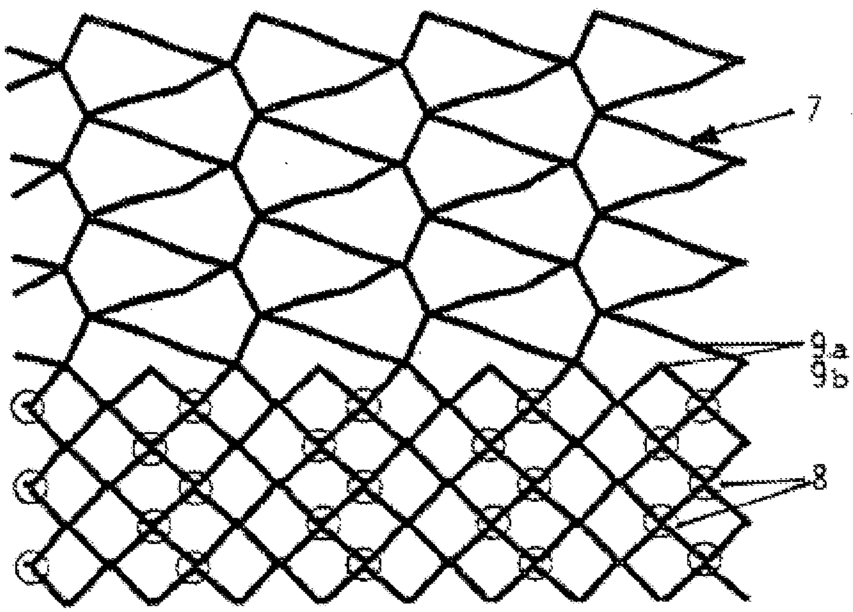


Figure 5

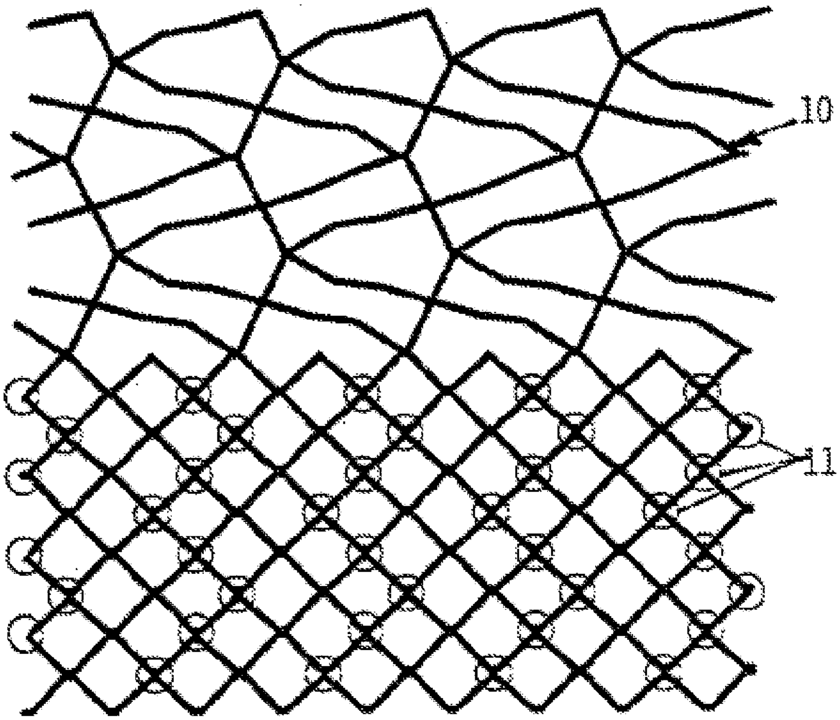


Figure 6

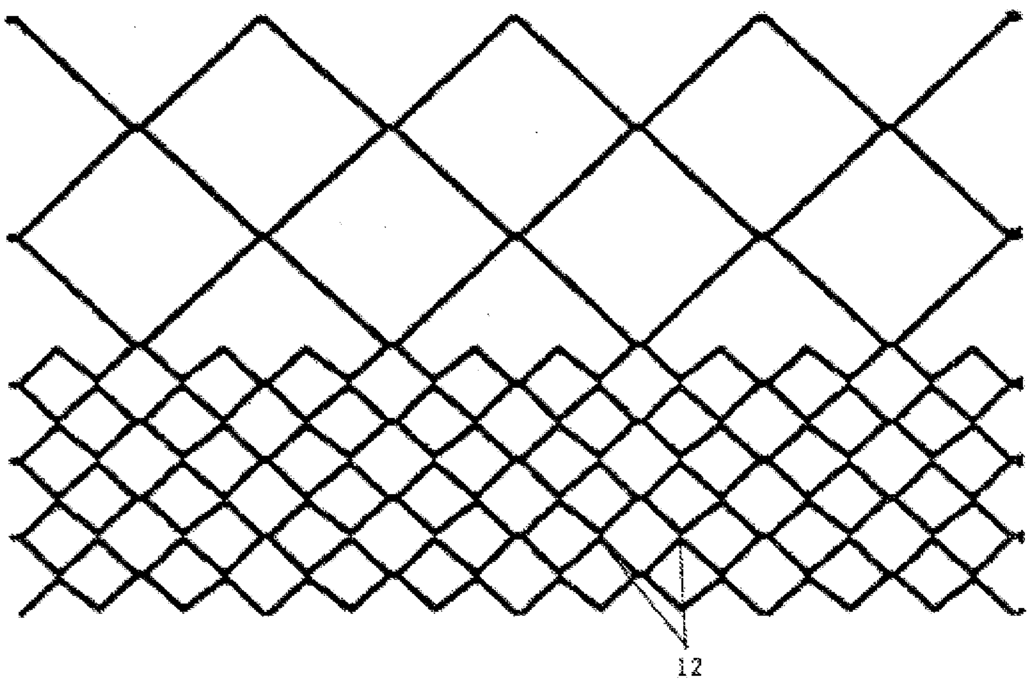


Figure 7

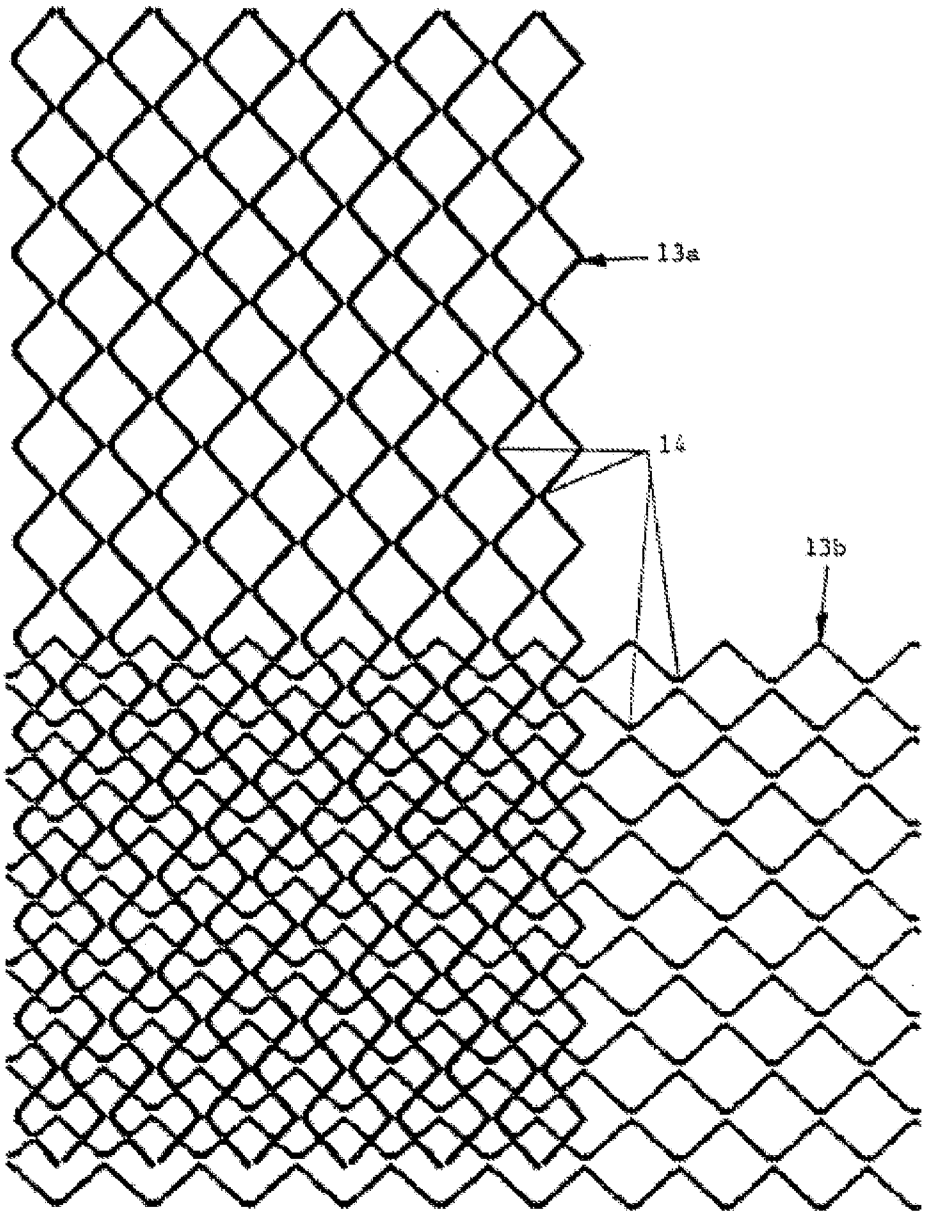
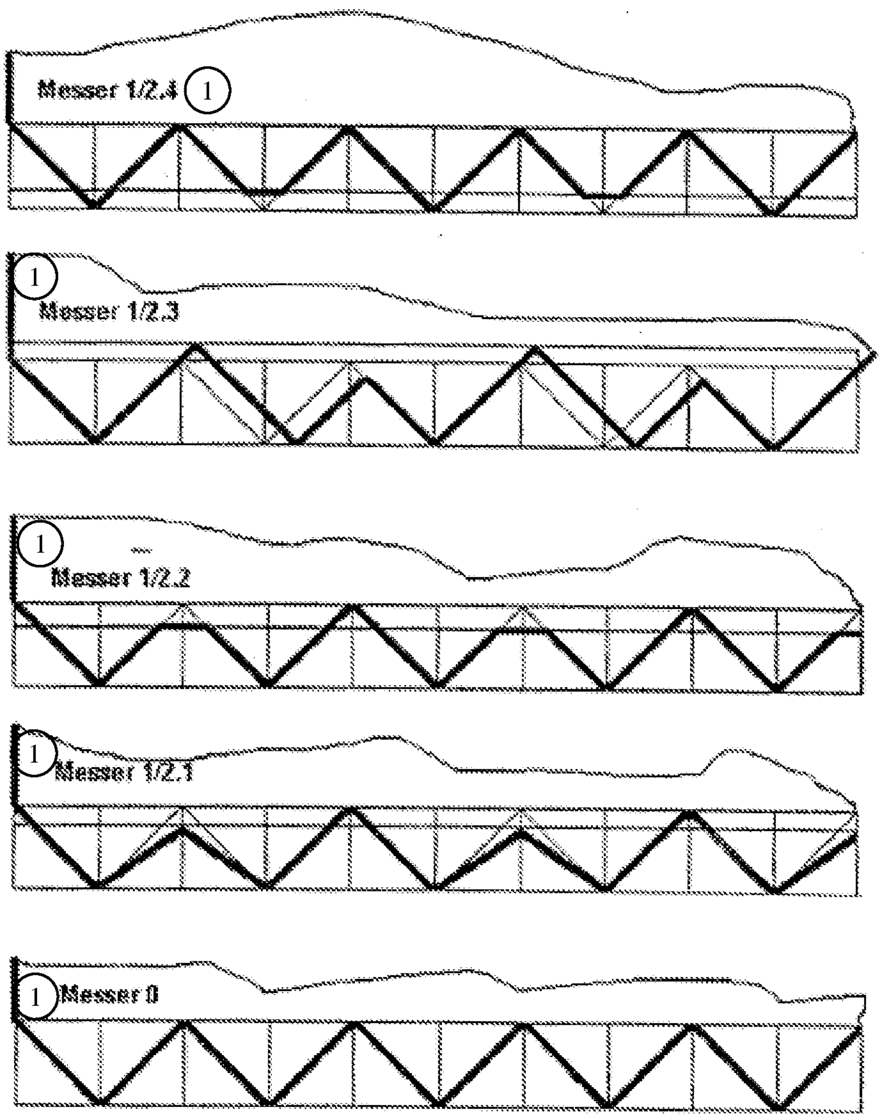


Figure 8



Figures 9

Key: 1 Knife

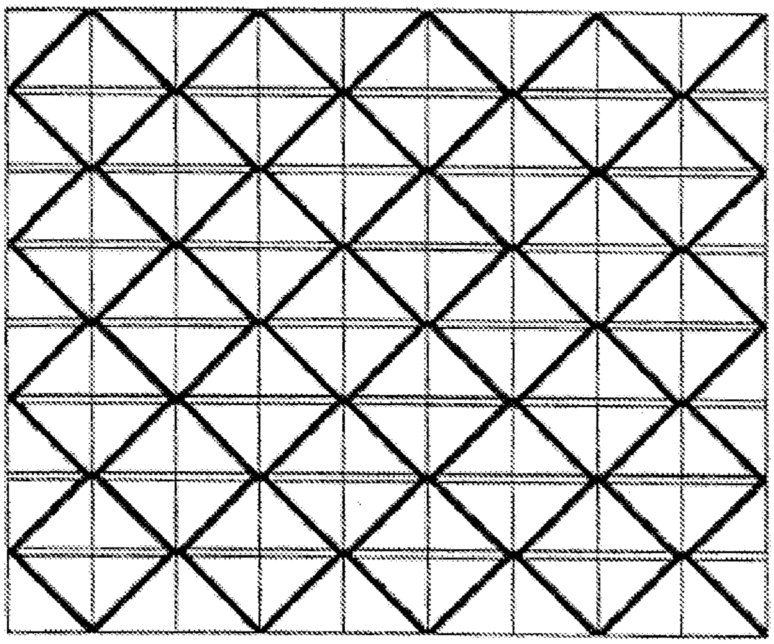


Figure 10

Key: 1 Mesh